National Security Implications of Climate Change and Sea-Level Rise

2013 Association of Opinion Journalists Convention

Vice Admiral Lee Gunn, USN (Ret.)
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CNA’s Leadership on Climate Energy & National Security

**CNA**—Research organization providing in-depth analysis and solutions for government leaders

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- Vice Admiral Denny McGinn, USN (Ret)
- Vice Admiral Lee Gunn, USN (Ret)
- Sherri Goodman
CNA MAB National Security Framework

• Economic Strength
• Geopolitical Stability
• Military Capability
• Environmental Sustainability

• National Security and the Threat of Climate Change
• Powering America’s Defense: Energy and the Risks to National Security
• Powering America’s Economy: Energy Innovation at the Crossroads of National Security Challenges
• Ensuring America’s Freedom of Movement: A National Security Imperative to Reduce US Oil Dependence.

National Security Is More Than DOD
Projected climate change poses a serious threat to America’s national security.

Climate change is a threat multiplier for instability in some of the most volatile regions of the world.

Projected climate change will add to tensions even in stable regions of the world.

Climate change, national security, and energy dependence are a related set of global challenges.
The Science of Sea Level—
Its all Relative

Relative sea level rise

Sea level rise + Land subsidence

Results in
Coastal flooding

1. Steric expansion of water with warmer temperatures
2. Increasing runoff/meltwater with warmer temperatures
3. Increasing sedimentation of basin decreases basin volume
4. Compression of surface layers
5. Compression of deeper layers due to groundwater extraction
6. Tectonic plate movements
7. Forebulge collapse from glacier retreat with warmer temperatures
8. Accumulated weight of sediment weighs down continental shelf

CNA ANALYSIS & SOLUTIONS
Global Ocean Heat Content

0-2000 m Global Ocean Heat Content

- 3-Month average through Apr-Jun 2013
- Yearly average through 2012
- Pentadal average through 2008-2012

NOAA/NESDIS/NODC Ocean Climate Laboratory
Updated from Levitus et al. 2012
Glacier Melting Causes Sea Level Rise

Pederson Glacier  Alaska 1917  Alaska 2005
Glacier Melting Causes Sea Level Rise

Columbia Glacier
Alaska 2006
Alaska 2012

Photographs by James Balog and Matthew Kennedy with Extreme Ice Survey
Glacier Melting Causes Sea Level Rise

Progressive retreat of the Gangotri Himalayan glacier 1780-2001
Greenland Ice Sheet
Arctic Sea Ice (1994 – 2012)
...but 8K Years of Stability
Future Sea Level Rise

Global mean sea level rise

Mean over 2081–2100

IPCC WGI 5 27 Sept 2013
Basic Human Needs Pyramid

- Fresh Water
- Energy
- Food
- Shelter
Impact of Sea Level Rise on Needs Pyramid

**Fresh Water**
- Contaminates Aquifers
- Worsens Storm Surges

**Energy**
- Destroys Infrastructure
  - Buildings (shelters)
  - Ports
  - Energy
  - Roads and rails

**Shelter**
- Eliminates Land and Habitats

**Food**
- Eliminates Agriculture Lands
Sea Level Rise—Impact on South East U.S.

University of Arizona
3.7M people within 1m of high tide

Sea Level and Storm Surge

Contribution to NYC Storm Surge

Kemp & Horton, *J. Quaternary Sci*, 2013
Sea Level and Mekong Delta

One meter sea level rise inundation

Elevation 2.5m asl
- 2m
- 3m
- 4m
- 5m

CNA ANALYSIS & SOLUTIONS
Sea Level and India

Effects of sea level rise on Tamil Nadu coast
Sea Level and Low Lying Islands
Sea Level and National Security

- Economic Strength
- Geopolitical Stability
- Military Capability
- Environmental Sustainability

Fresh Water

Energy

Food

Shelter

Human Impacts (Health, Prosperity)

State/Regional Stability

US National Security
Almost **40 percent** of South Asia’s **2 billion people** live within **100 miles** of the coast.

Inundation of coastal areas, with loss of settled areas and agricultural land.

Threats to water including loss of glacier fed rivers will increase cross border tensions.
Country Specific Impacts: Bangladesh

Socio-economic and political conditions

- **150-170 million people**, eighth most populous
- One of **most densely populated**
- GDP drivers are service and agriculture
- “Among Bangladesh’s most significant obstacles to growth are poor governance and weak public institutions.” World Bank

Climate challenges

- **Ranks first as the most vulnerable nation to the impacts of climate change** in the coming decades
- Rainfall, rising sea levels, and tropical cyclones are expected to increase
- Sea level and extreme weather will affect agriculture, water and food security, human health and shelter
- Rising sea level expected to create more than 20 million refugees
“Significant upheaval related to the warming planet is probably the most likely thing that is going to happen . . . that will cripple the security environment, probably more likely than the other scenarios we all often talk about.”

“We have interjected into our multilateral dialogue - even with China and India - the imperative to kind of get military capabilities aligned [for] when the effects of climate change start to impact these massive populations,”

“If it goes bad, you could have hundreds of thousands or millions of people displaced and then security will start to crumble pretty quickly.”

—Admiral Samuel Locklear, March 2013
US Military Infrastructure: Examples
US Military Infrastructure: Examples
The Future

Recognize

Respond
Adaptations
Resilience
PACOM: Partners Must Build Capabilities

• In the Indo-Asia Pacific region, as we go from about 7 billion people in the world to 9 or 10 by the century, about 70 percent of them are going to live in this part of the world.

• About 80 percent of them today live within about 200 miles of the coast, and increasing...

• About 800,000 people were displaced and there was about $500 billion of lost productivity. So when I look and I think about our planning and I think about what I have to do with allies and partners and I look long-term, it’s important that the countries in this region build the capabilities into their infrastructure to be able to deal with the[se] types of things...

—Admiral Samuel Locklear, April 2013
“We...still believe that our obligations ... are not just to ourselves, but to all posterity. We will respond to the threat of climate change, knowing that the failure to do so would betray our children and future generations.”

—President Obama, January 2013
Discussion
Back-up
Global Air Temperature Anomalies

How "Skeptics" and Realists View Global Warming

Global Surface Temperature Change (°C)